

**MEASURING MULTIMODAL EMOTIONAL PROCESSING IN
TRAUMA-FOCUSED COGNITIVE BEHAVIORAL THERAPY:
AN INTEGRATIVE APPROACH**

by

Elizabeth Alpert

A thesis submitted to the Faculty of the University of Delaware in partial
fulfillment of the requirements for the degree of Master of Arts in Psychology

Winter 2018

© 2018 Elizabeth Alpert
All Rights Reserved

**MEASURING MULTIMODAL EMOTIONAL PROCESSING IN
TRAUMA-FOCUSED COGNITIVE BEHAVIORAL THERAPY:
AN INTEGRATIVE APPROACH**

by

Elizabeth Alpert

Approved: _____
Adele M. Hayes, Ph.D.
Professor in charge of thesis on behalf of the Advisory Committee

Approved: _____
Robert F. Simons, Ph.D.
Chair of the Department of Psychological and Brain Sciences

Approved: _____
George H. Watson, Ph.D.
Dean of the College of Arts and Sciences

Approved: _____
Ann L. Ardis, Ph.D.
Senior Vice Provost for Graduate and Professional Education

ACKNOWLEDGMENTS

I wish to express my deep gratitude to my advisor, Adele Hayes, for her exceptional mentorship, guidance, and generosity. I would also like to thank Beth Ready, Carly Yasinski, Ben Barnes, Garret Sacco, Thomas McCauly, Vanniesha Bennett, Keith Brown, Alyssa Fazio, Caitlin Wilson, and Joanna Osborne for their contributions to data collection and coding, as well as Esther Deblinger and Charles Webb, investigators of the trial from which these data were collected. Additionally, I am grateful to J-P Laurenceau and Emily Soriano for providing statistical consultation. This project was funded by grants from the Substance Abuse and Mental Health Services Administration (SAMHSA: SM57145) to the Delaware Division of Prevention and Behavioral Health Service and the National Institute of Mental Health (NIMH: R01-MH086558) to Adele M. Hayes. Finally, my gratitude is also extended to my friends and family for their support and encouragement.

TABLE OF CONTENTS

LIST OF TABLES	vi
ABSTRACT	vii

Chapter

1	INTRODUCTION	1
1.1	Greenberg's Theory of Emotional Processing	4
1.2	Cognitive Theories of Change	5
1.3	Implications for Measurement of Emotional Processing	7
1.4	The Current Study	8
1.4.1	Hypotheses.	9
2	METHODS	12
2.1	Participants	12
2.2	Procedure	13
2.2.1	Therapy.	13
2.3	Measures	14
2.3.1	Session coding.	14
2.3.1.1	Calculating composite scores.	15
2.3.1.1.1	Preliminary confirmatory factor analyses. .	20
2.3.1.1.2	Negative and positive network activation. .	22
2.3.1.1.3	Maladaptive and adaptive emotion regulation (ER) strategies.	22
2.3.2	Treatment outcomes.	23
2.4	Data Analytic Approach	23
3	RESULTS	26

3.1	Preliminary Analyses.....	26
3.2	Predictors of Treatment Outcome	30
4	DISCUSSION.....	32
4.1	Strengths, Limitations, and Future Directions.....	36
4.2	Conclusion.....	40
	REFERENCES	42
Appendix		
A	INSTITUTIONAL REVIEW BOARD EXEMPTION	49

LIST OF TABLES

Table 2.1: CHANGE coding categories with descriptions, examples of high levels of each variable, and intra-class correlations (ICCs) of inter-rater agreement.	16
Table 3.1: Descriptive statistics for and intercorrelations among within-person composite variables representing components of emotional processing.	27
Table 3.2: Descriptive statistics and intercorrelations among between-person outcome measures.	28
Table 3.3: Fixed effects and random effects for within-person slopes of change over time of composite variables representing components of emotional processing.	29
Table 3.4: Regression results for within-person slopes of components of emotional processing (negative and positive networks of functioning and maladaptive and adaptive emotion regulation strategies) predicting post-treatment outcomes (internalizing and externalizing symptoms), controlling for baseline symptoms.	31

ABSTRACT

Emotional processing theory (Foa & Kozak, 1986; Foa, Huppert, & Cahill, 2006) posits that psychopathology related to anxiety and traumatic stress is maintained by a maladaptive network of stimulus, response, and meaning elements. Exposure therapies seek to weaken this network and strengthen a network of adaptive learning. Research on exposure therapies has generally highlighted fear extinction as the hypothesized mechanism of change, but fear extinction has not consistently predicted treatment outcomes, prompting some researchers to question the utility of emotional processing theory. The current study seeks instead to broaden measurement of emotional processing to more fully test the most recent version of the theory. In a community sample of 81 trauma-exposed youth (67% female, ages 7-17) receiving trauma-focused cognitive behavioral therapy (TF-CBT), we examined changes in four components of emotional processing during the trauma processing phase of TF-CBT as predictors of post-treatment internalizing and externalizing. These included: 1) negative networks of trauma-related functioning (cognitive, emotional, behavioral, somatic); 2) positive networks of functioning in the same domains; 3) maladaptive emotion regulation (ER) strategies (avoidance, rumination, overgeneralization); and 4) adaptive ER strategies (decentering, meaning-making, accommodation). More curvilinear (concave-down) change over time in negative networks and greater decreases in maladaptive ER strategies predicted lower post-treatment internalizing symptoms, and greater increases in positive networks and adaptive ER strategies predicted lower post-treatment externalizing symptoms. Findings suggest promise in

broadening measurement of emotional processing to incorporate changes in an array of negative and positive areas of functioning during treatment.

Chapter 1

INTRODUCTION

Many evidence-based treatments for anxiety disorders and other internalizing disorders are based on emotional processing theory (Foa & Kozak, 1986; Foa, Huppert, & Cahill, 2006). Extending Lang's (1977) theory of emotional processing, Foa and colleagues proposed that psychopathology related to anxiety and traumatic stress is maintained by a maladaptive fear network that is comprised of fear stimuli, fear response elements (e.g., emotional, behavioral, somatic), and meaning. Emotional processing occurs when the fear network is activated and new, corrective information is introduced that challenges the old learning and promotes new, more adaptive learning. The early Foa and Kozak (1986) theory emphasized habituation as the central mechanism of emotional processing, but updates to the theory (Foa et al., 2006; Foa & McNally, 1996) highlight the importance of changing responses to fear stimuli more generally, including cognitive change. The current theory (Foa et al., 2006) also incorporates recent findings on inhibitory learning (e.g., Bouton, 2000) and notes that with repetition, the new learning from emotional processing can co-exist with or inhibit the fear network, rather than replace it.

Exposure therapies, developed based on emotional processing theory, have extensive evidence for their efficacy in both adults and children (see Foa & McLean, 2016 for a review). Foa and colleagues (1986; 2006) have long held that pathological fear networks are maintained by behavioral and cognitive avoidance, as well by cognitive biases in processing information related to fear stimuli. Avoidance interferes

with exposure to new information that is inconsistent with the existing elements of the pathological fear network, and cognitive biases interfere with adaptive integration of this new information. During treatment, therapists guide clients in exposure to feared stimuli and then help clients to process these exposures. These exposure procedures reduce avoidance and allow fear extinction, cognitive change, and meaning-making to occur, ultimately reducing the strength of the maladaptive fear network and bolstering a new network of adaptive responses to previously-feared stimuli.

The proposed mechanisms of change for exposure therapies have historically emphasized fear extinction both within-session (i.e., a decrease in distress response to a fear-provoking stimulus across a therapy session) and between sessions (i.e., a decrease in maximum distress level reached in response to fear-provoking stimuli over multiple therapy sessions). Researchers have indexed fear extinction in response to a feared stimulus as reductions in subjective units of distress (SUDS), which are reported by clients on a scale of 0-100 or 0-10, or by reductions on physiological measures of distress such as heart rate and skin conductance. Based on the large body of research operationalizing emotional processing as fear extinction, recent reviews (e.g., Asnaani, McLean, & Foa, 2016; Craske et al., 2008) have concluded that within-session extinction largely does not predict symptom reduction during treatment for anxiety and trauma-related disorders, whereas between-session extinction does often, but not always, predict symptom reduction. Mixed findings for between-session extinction as a mechanism of emotional processing continue to raise questions about the validity and utility of emotional processing theory (Baker et al., 2010; Craske et al., 2008). However, fear extinction is only one indicator of emotional processing.

Emotional processing theory (Foa & Kozak, 1986; Foa et al., 2006) proposes other indicators of emotional processing besides fear extinction. In their 2006 update of the theory, Foa and colleagues write, "...the proposed mechanism underlying symptom reduction is the modification of the relevant erroneous associations through disconfirming information, *not through habituation per se*" (p. 9-10). Emotional processing theory suggests maladaptive associations among stimuli, responses, and meaning can change not only through fear extinction, but also through adaptive shifts in cognitive, behavioral, and non-fear emotional responses to feared stimuli. Recently, Foa and colleagues have considered the role of emotions such as anger, shame, guilt, and disgust (e.g., Kaczurkin, Asnaani, Zhong, & Foa, 2016; McLean & Foa, 2017). They also highlight the important role of cognitive changes in the measurement of emotional processing (Foa & McLean, 2016; McLean, Yeh, Rosenfield, & Foa, 2015).

In response to perceived shortcomings of emotional processing theory, Craske and colleagues have sought to fine-tune an inhibitory learning theory of change in exposure therapies to improve treatment efficacy and potency. Rather than broadening the measurement of emotional processing to incorporate other emotional, cognitive, and behavioral responses to fear stimuli, as Foa and colleagues have more recently begun to do, Craske and colleagues (e.g., Craske et al., 2008; Craske, Treanor, Conway, Zbozinek, & Vervliet, 2014) have largely maintained focus on fear extinction processes. This line of research on inhibitory learning has identified a number of processes that, when maximized during exposure to feared stimuli, promote new learning of a non-fear response that can inhibit the original fear response and maintain its inhibitory effect over time. Thus far, Craske and colleagues have identified expectancy violation, deepened extinction, occasional reinforced extinction,

removal of safety signals, variability, retrieval cues, multiple contexts, and affect labeling as processes that strengthen non-fear responses to previously-feared stimuli (Craske et al., 2014). As with Foa and colleagues' updated version of emotional processing theory (2006), Craske and colleagues' work (2008, 2014) emphasizes the facilitation and measurement of new learning elements that compete for activation with, rather than replace (Foa & Kozak, 1986), old fear networks.

Inhibitory learning theory focuses largely on change in only one type of response to feared stimuli as the desired outcome: the fear response. Inhibitory learning theory also moves away from emotional processing theory in that it highlights expectancy violation, affect labeling, and distress tolerance, among other therapeutic principles (Arch & Craske, 2008). While inhibitory learning findings are improving exposure practices and our understanding of possible mechanisms of their efficacy (Jacoby & Abramowitz, 2016), another way to improve our understanding may be to broaden the measurement of emotional processing to better assess the posited multimodal network of maladaptive emotional, cognitive, somatic, and behavioral responses to fear stimuli, as well adaptive learning in the same domains. In addition to drawing from Craske and colleagues' emphasis on measuring new learning, other emotional and cognitive theories of change can also inform a broader, more integrated measurement of emotional processing. By expanding the conceptualization and measurement of emotional processing, researchers can more fully test the updated emotional processing theory of change in exposure-based treatments (Foa et al., 2006).

1.1 Greenberg's Theory of Emotional Processing

While emotional processing (Foa et al., 2006) and inhibitory learning models (Craske et al., 2008, 2014) have tended to focus specifically on fear responses in

anxiety and related disorders, Greenberg and colleagues emphasize emotions more broadly in their theory of change. They, too, have extended Lang's (1977) work and use the term emotional processing to refer to therapeutic change in affective-cognitive meaning networks ("schemes"), which include emotional stimuli, emotional and somatic responses, and related cognitions and meaning (Greenberg, 2002; Greenberg, 2012; Greenberg & Safran, 1987; Pos, Greenberg, Goldman, & Korman, 2003). According to this theory of emotional change, clinicians can best promote therapeutic change by helping clients activate and maintain contact with their emotions ("experiencing"), as well as by transforming their emotions and making new meaning from them (Greenberg, 2012; Pos et al., 2003). Emotion-focused trauma therapy is based on these principles (Greenberg & Foerster, 1996; Paivio & Greenberg, 1995; Paivio, Hall, Holowaty, Jellis, & Tran, 2001) and has been shown to be effective in adult survivors of childhood abuse (Paivio & Nieuwenhuis, 2001; Paivio et al., 2001). Greenberg's theory and evidence for related therapies suggest that it is important to assess a broader range of emotional responses and meaning, in addition to measuring fear responses.

1.2 Cognitive Theories of Change

Beck and colleagues (e.g., Beck & Dozois, 2011; Disner, Beevers, Haigh, & Beck, 2011) also propose that a maladaptive network maintains symptoms, but this network is specifically cognitive; it includes maladaptive beliefs, schemas, meanings, memory biases, attention biases, and processing biases. This network in turn influences and is influenced by emotions, behaviors, and somatic responses (Beck & Dozois, 2011). Ehlers and Clark (2000) extended this work to develop a cognitive model of PTSD, which posits that negative cognitive appraisals of the trauma and its

sequelae lead to dysfunctional coping strategies, which in turn maintain PTSD symptoms and the appraisals themselves.

Cognitive therapies for adults and children with PTSD, such as cognitive therapy for PTSD (Ehlers & Clark, 2000; Perrin et al., 2014) and cognitive processing therapy (Resick & Schnicke, 1992; Resick, Monson, & Chard, 2017), focus on helping clients to approach their trauma memories and restructure the maladaptive trauma-related beliefs and appraisals maintaining their symptoms. Evidence suggests that decreasing negative cognitions and engaging in cognitive processing, in both these cognitive therapies and exposure-based therapies such as prolonged exposure for PTSD (Foa, Hembree, & Rothbaum, 2007), predict better outcomes in children and adolescents (e.g., McLean et al., 2015; Pfeiffer, Sachser, de Haan, Tutus, & Goldbeck, 2017; Ready et al., 2015; Smith et al., 2007) and in adults (e.g., Ehlers, Mayou, & Bryant, 1998; Dondanville et al., 2016; Kleim et al., 2013; McLean, Su, & Foa, 2015; Scher, Suvak, & Resick, 2017; Zalta et al., 2014). There is also evidence that unconstructive modes of cognitive processing (Watkins, 2008), such as rumination and overgeneralization of negative beliefs, act as maladaptive emotion regulation (ER) strategies (Gross, 2008) that maintain the pathological network and predict worse outcomes in PTSD treatment (Dondanville et al., 2016; Ehlers et al., 1998; Iverson, King, Cunningham, & Resick, 2015; Ready et al., 2015). On the other hand, constructive modes of processing, like decentering to view one's thoughts from an adaptive distance and accommodation of corrective information to arrive at balanced beliefs, act as adaptive forms of ER (Gross, 2008) that predict better outcomes (Dondanville et al., 2016; Hayes et al., 2017; Iverson et al., 2015; Ready et al., 2015). While these constructs are typically referred to as forms of unconstructive and

constructive repetitive thought or processing (Watkins, 2008), we use the term “emotion regulation strategies” or “ER strategies” because they are attempts to manage emotions (Gross, 2008) and to avoid confusion with the overarching construct of emotional processing.

In a recent review, Foa and McLean (2016) reaffirmed the important role of cognitive change in emotional processing theory. This affirmation is in line with a clinical focus in prolonged exposure and other exposure-based treatments on encouraging clients to make new meaning and gain new insight and perspective on events in their lives during the “processing” portion of treatment sessions (e.g., Foa et al., 2007). Cognitive theories of therapeutic change inform the study of emotional processing theory by highlighting the importance of measuring cognitive responses to stimuli and cognitive ER strategies as part of multimodal networks of psychopathology and new learning. Measuring cognitive changes as part of emotional processing is in line both with recent research findings (e.g., McLean et al., 2015) and with the clinical emphasis on belief change—not only fear reduction—during exposure treatments (e.g., Foa et al., 2007).

1.3 Implications for Measurement of Emotional Processing

Researchers largely agree that constructive processing in psychotherapy occurs when maladaptive patterns are activated and new, inconsistent information and experiences are introduced to facilitate a shift to more adaptive patterns. The various theories of cognitive and emotional processing differ in which network components (cognition, emotion, behavior, somatic) are emphasized, and how processing is measured. Typically, researchers have measured only one or two components at a time (e.g. only fear reduction or cognitive change) as predictors of treatment outcome. Yet,

emotional processing theory and other theories of cognitive and emotional change (e.g., Beck & Dozois, 2011; Greenberg, 2012) posit a multimodal pathological network, as well as a new adaptive network that is learned in treatment. This suggests the importance of measuring multiple domains of both negative and positive functioning. In addition, it is important to measure ER strategies that both prevent change in the pathological network and that facilitate the learning of adaptive associations. Measuring changes in cognitive, emotional, behavioral, and somatic domains in the pathological network and in new learning, as well as maladaptive and adaptive ER strategies that interfere with and facilitate change, would move closer to testing the most recent update of emotional processing theory (Foa et al., 2006).

1.4 The Current Study

The current study examined emotional processing as a predictor of symptom outcomes in a community sample of youth receiving an exposure-based treatment: trauma-focused cognitive behavioral therapy (TF-CBT; Cohen, Mannarino, & Deblinger, 2006). TF-CBT is an evidence-based treatment for children and adolescents who have experienced a wide range of childhood traumas. By studying emotional processing in this sample, we were able to examine treatment processes as they occurred in real-world settings and contribute to a growing literature on cognitive behavioral treatments for children and adolescents and their potential mechanisms of change (Weisz & Kazdin, 2010).

The CHANGE (Hayes, Feldman, & Goldfried, 2007), an observational coding system designed to assess therapeutic change processes, was used to code sessions during the trauma processing phase of TF-CBT. During this phase of treatment, therapists work with youth to develop a trauma narrative and discuss youths'

responses to trauma-related content, facilitating exposure to trauma-related stimuli and processing of the experiences. Negative and positive domains of functioning (i.e., cognitions, emotions, behaviors, and somatic experiences) were coded to represent the nodes in networks of old and new learning (i.e., maladaptive and adaptive associations between trauma-related stimuli, responses, and meaning). Maladaptive ER strategies that can interfere with new learning (avoidance, rumination, and overgeneralization) and adaptive ER strategies that can facilitate it (decentering, meaning-making, and accommodation) were also coded. To align better with the components of the most recent version of emotional processing theory (Foa et al., 2006), we examined extent of multimodal activation of both the pathological and adaptive networks and also the strength of the change-interfering and change-promoting ER strategies as predictors of treatment outcomes.

1.4.1 Hypotheses.

Emotional processing theory (Foa & Kozak, 1986; Foa et al., 2006) and reviews of its evidence (e.g., Asnaani et al., 2016; Craske et al., 2008; Foa & McLean, 2016) suggest the importance of an overall decrease in negative domains of functioning (i.e., cognitive, emotional, behavioral, and somatic components of a pathological network) across sessions. Although findings specifically examining fear reduction have been mixed (Asnaani et al., 2016; Craske et al., 2008), we expected greater decreases in the broader construct of multimodal negative domain activation—representing the weakening of a network of maladaptive responses—to predict lower psychopathology (internalizing and externalizing symptoms) at post-treatment. In addition, we hypothesized that a more curvilinear pattern of change (concave down) in negative networks would predict better symptom outcomes at the end of treatment,

beyond the linear change. A concave down curvilinear pattern might reflect successful gradual activation of the negative network over the first few sessions of exposure to the trauma narrative, followed by weakening of the negative network during the rest of the trauma processing phase of TF-CBT. We further hypothesized, based on prior research (Ehlers et al., 1998; Iverson et al., 2015; Ready et al., 2015), that greater decreases in maladaptive ER strategies (avoidance, rumination, and overgeneralization) during this same trauma processing phase would predict better treatment outcomes. There is no theoretical reason to expect that change in maladaptive ER strategies would increase and then decrease (curvilinear pattern); therefore only the linear slope was examined.

Studies examining new learning during exposure therapy also suggest the importance of multimodal networks of positive functioning (cognitive, emotional, behavioral, and somatic; e.g. Dour, Brown, & Craske, 2016; Zbozinek & Craske, 2017). We therefore expected that greater increases in positive network activation during the exposure phase of therapy would predict better post-treatment outcomes. Similarly, we expected that greater increases in adaptive ER strategies (decentering, meaning-making, and accommodation) would predict better treatment outcomes, in line with prior evidence (Dondanville et al., 2016; Hayes et al., 2017; Iverson et al., 2015; Ready et al., 2015).

This is the first study to our knowledge to explicitly measure changes in multimodal activation of networks of both old and new learning, as well as maladaptive and adaptive ER strategies, in order to examine the multiple components of current emotional processing theory (Foa et al., 2006). This measurement of emotional processing is also informed by and integrated with other prominent theories

of change in PTSD (inhibitory learning, emotional experiencing, and cognitive theories). Further, very little process research has been conducted in clinical trials of youth with PTSD.

Chapter 2

METHODS

2.1 Participants

Participants were recruited as part of a larger effectiveness trial of trauma-focused cognitive behavioral therapy (TF-CBT) for trauma-exposed youth. Youth were eligible for the trial if they had a score of 17 or more on the UCLA PTSD Reaction Index for DSM-IV-Abbreviated (UPID-A) or endorsed 3 of 9 PTSD symptoms based on an independently verified (e.g., through child welfare) trauma (e.g., Steinberg, Brymer, Decker, & Pynoos, 2004). Eligible youth also spoke English, qualified for publically-funded treatment, and had a non-offending caregiver willing to participate in treatment. Youth were excluded if they had an intellectual disability, had untreated psychosis or current substance abuse, required frequent hospitalizations or a higher level of care, or had a sibling already in the study. Of the 109 participants who met inclusion criteria for the effectiveness trial, 81 youth were included in the present sample because they had at least one audio-recorded session during the second phase of treatment. The youth included in the present sample did not differ demographically from the 28 participants who discontinued treatment before the trauma processing (second) phase of treatment. The current sample included 54 (66.7%) females and 27 (33.3%) males, ages 7-17 years old ($M = 12.6$, $SD = 2.8$). They were 51.9% White, 40.7% Black or African American, 3.7% Hispanic or Latino, and 3.7% Biracial. Youth had experienced on average 3.5 types of trauma ($SD = 1.7$). Thirty-seven percent of youth were in foster care when they enrolled. They completed an average of 5.28

sessions of the approximately 6 sessions in the trauma processing phase of TF-CBT ($SD = 2.17$, range = 1-14).

2.2 Procedure

2.2.1 Therapy.

Trauma-focused cognitive behavioral therapy (TF-CBT; Cohen et al., 2006) is an evidence-based treatment for children and adolescents who have experienced a range of childhood traumas, as well as their non-offending caregivers. TF-CBT incorporates psychoeducation, skills-building, gradual exposure to traumatic memories, and cognitive processing of trauma-related content. Youth and caregivers meet with a therapist in separate 30- to 45-minute sessions for approximately 12-15 sessions and also in several conjoint sessions, if appropriate.

TF-CBT is divided into three phases. Phase 1, the *stabilization and skills building* phase, emphasizes psychoeducation and coping skills, such as relaxation and emotion regulation skills. In phase 2, the *trauma narration and processing* phase, the youth develops a detailed written narrative of his or her trauma. As the youth creates and discusses the narrative, the therapist helps him or her to emotionally process the experience and challenge maladaptive beliefs about the trauma, its meaning, and its consequences. The third phase, the *consolidation and closure* phase, includes in vivo mastery activities when needed, trauma-focused conjoint sessions in which the youth shares the narrative with the caregiver when clinically appropriate, and the development of personal safety skills. Therapy was delivered by a team of 25 clinicians, who either held a professional degree or were doctoral students in clinical psychology programs; unlicensed clinicians were supervised by a licensed

practitioner. Adherence ratings suggested that therapists delivered TF-CBT with fidelity (see Ready et al., 2015 for further details).

2.3 Measures

2.3.1 Session coding.

The Change and Growth Experiences Scale (CHANGE; Hayes et al., 2007) was used to code each treatment session of the trauma processing phase of treatment. The CHANGE is designed to capture variables thought to be central to therapeutic change, including both facilitators and inhibitors of change. This coding system has been used to code written narratives in cognitive behavioral treatments for depression (Hayes, Beevers, Feldman, Laurenceau, & Perlman, 2005; Hayes et al., 2007) and adult PTSD (Barnes, 2017) and in audiotaped sessions of cognitive therapy for personality disorders (Hayes & Yasinski, 2015) and treatment-resistant depression (Abel, Hayes, Henley, & Kuyken, 2016). Each CHANGE variable is coded on a four-point scale from 0 (*absent or very low*) to 3 (*high*).

In the current study, a team of 19 coders consisting of graduate and undergraduate students coded audio recordings of sessions. Coders were trained in the CHANGE system and then practiced coding with experienced coders until they reached sufficient agreement on target variables (intraclass correlations (ICCs) of $\geq .80$). Two coders rated each session, and weekly consensus meetings were held to prevent rater drift over time and to reach group consensus on discrepancies of two or more points on the four-point scale of the CHANGE. Consensus ratings were used in analyses, and ratings were averaged between the two coders.

Each session was coded for a series of variables meant to capture various domains of functioning, as well as ER strategies that maintain psychopathology and facilitate therapeutic change, in session and over the past week. Positive and negative domains of functioning, coded separately, included cognitions, emotions, behaviors, and somatic experiences. Maladaptive ER strategies that maintain psychopathology included avoidance, rumination, and overgeneralization. Adaptive ER strategies that facilitate therapeutic change included decentering, meaning-making, and accommodation. Detailed descriptions of each coding category, as well as examples of session content that would be coded as “high,” are presented in Table 2.1. For each variable, a final intra-class correlation (ICC) was calculated by computing the ICC for each coder pair and then averaging across coders, as recommended by Hallgren (2012). ICCs ranged from .66-.91, which is in the good to excellent range of agreement (see Table 2.1).

2.3.1.1 Calculating composite scores.

Coding scores for individual CHANGE variables were used to calculate composite scores for: 1) activation of a network of negative domains of functioning representing the pathological network, 2) a network of positive domains of functioning representing new learning, 3) maladaptive ER strategies, and 4) adaptive ER strategies. Yancey, Venables, and Patrick (2016) highlight the utility of integrating different types of measurements into composite scores in order to operationalize multimodal constructs. The following sections describe the creation of composites measuring negative and positive network activation and maladaptive and adaptive ER strategies.

Table 2.1: CHANGE coding categories with descriptions, examples of high levels of each variable, and intra-class correlations (ICCs) of inter-rater agreement.

Coding Category	Description	Example	ICC
Negative Self	Negative beliefs about the self, including expressions of negative self-worth, self-criticism, and feelings of failure.	“I feel like I’m broken. I don’t think I’m strong enough to get past this.”	.66
Positive Self	Positive beliefs about the self, including a sense of worth, competency, desirability, self-acceptance, and pride.	“I felt good that I was able to handle it when I got scared. I was proud of myself.”	.78
Negative Relationships	Perceived negative quality of relationships with others or interactions with others, including specific people and people in general.	“It makes me not want to trust people. I think most people probably want to hurt you like my dad hurt me.”	.91
Positive Relationships	Perceived positive quality of relationships with others or interactions with others, including specific people and people in general.	“I helped her [mother] with the cleaning, and we actually had a pretty good time. Then she took me out for dinner and it was really nice.”	.82
Negative Hope	Feelings of being stuck or having no way out, feeling tired of trying, or negative beliefs about the future.	“I feel so horrible, and it’s always going to be like this. I can’t see a way out.”	.76
Positive Hope	Capacity to see possibility of change in the future, determination to making changes, or positive beliefs about the future.	“I have a scar on my heart, but it’s healing. I think I’ll be okay.”	.70

Table 2.1 Continued

Negative Emotion	Rated based on the number and intensity of negative emotion words (e.g., anxious, sad, angry, ashamed, guilty) and quality of the emotional tone (e.g., crying).	“I hurt so bad. I feel guilty that my dad got arrested because of me, and I’m so embarrassed.”	.82
Positive Emotion	Rated based on the number and intensity of negative emotion words (e.g., happy, calm, excited) and quality of the emotional tone (e.g., laughing).	“I felt better this week. I felt pretty calm. And I was happy that I talked to my mom and told her my story.”	.85
Negative Behaviors	Maladaptive actions in which the person engages, rated based on number of behaviors and their intensity.	“Then I lost it and started yelling at him [brother]. I just kept yelling and telling him he didn’t know what he was talking about.”	.88
Positive Behaviors	Adaptive actions in which the person engages, or exhibiting control so as not to engage in a maladaptive behavior.	“Instead of punching him [boy in neighborhood], I took a deep breath and told him to stop talking to me like that.”	.81
Negative Somatic	Negative physiological experiences resulting from a person’s thinking or emotions.	“When I was talking to him I felt really shaky, like I was going to throw up.”	.85
Positive Somatic	Positive physiological experiences resulting from a person’s thinking or emotions.	“I tried doing those relaxation exercises you taught me, and I felt really calm after.”	.86

Table 2.1 Continued

Avoidance	Difficulty engaging or remaining with aversive emotions, thoughts, memories, or somatic sensations. Includes not talking, pulling away, withdrawing, shutting down, or showing emotional blunting.	“I don’t want to face it [trauma memory]. I want to push it back. I just want it to go away.”	.73
Ruminative Processing	Approaching, exploring, and attempting to make meaning of a problem area but becoming stuck repeatedly thinking about or analyzing the issue without significant insight. Includes analysis without progress, emotional venting, worry, or intrusive re-experiencing.	“I can’t stop thinking about what happened to me...I keep playing things over and over in my head and it won’t stop.”	.84
Overgeneralization	Global, exaggerated beliefs about self, others, or the world related to the traumatic event broadly applied across time and life situations.	“She [the abuser] left a scar on my heart that will never heal...my life is nothing but pain.”	.70
Decentering	The ability to step back from internal experiences and engage them from a healthy distance. The person can identify what they are thinking and feeling, recognize that this does not necessarily represent reality, and notice thoughts and feelings without immediately or automatically reacting to them.	“Just because I feel bad does not mean that it was my fault or I did anything wrong.”	.70

Table 2.1 continued

Meaning-Making	The extent to which the person is able to approach a problem and understand, explore, and make meaning of it. Captures changes in perspective and new insights gained.	“I’m glad I told my mom about it. I’m learning that I shouldn’t be so afraid of my feelings. I know it’s okay to talk about this now.”	.84
Accommodation	Expressing a balanced view of self, others, or the world. Includes integrating new information, arriving at more realistic and accurate perspectives, and the degree of realistic closure, acceptance, or resolution provided by these new beliefs.	“I felt like it [trauma] was my fault, but now I know it’s not my fault. He [abuser] did it, he started it.”	.75

2.3.1.1.1 Preliminary confirmatory factor analyses.

Preliminary multilevel confirmatory factor analyses (CFAs) were performed to confirm that for both negative and positive variables, observed measures of domains of functioning (cognitions, emotions, behaviors, and somatic experiences) and ER strategies (maladaptive: avoidance, rumination, and overgeneralization; adaptive: decentering, meaning-making, and accommodation) loaded best onto two factors, as compared with one-factor and three-factor models. Indicator variables and latent variables were specified at the within-person level in order to reflect variation within individuals over repeated measurements. We focused on the within-person factor structure of the CHANGE items because session-by-session within-person data were used in subsequent analyses to answer questions about individuals' change over the course of the trauma processing phase of TF-CBT. Indicators had Poisson distributions, but models specifying them as count variables failed to converge, so indicators were entered as categorical variables. For this reason, absolute model fit statistics (e.g., Chi-square difference tests) were not available; instead, comparative fit statistics were used to compare models, including the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC). For both the AIC and BIC, lower numbers indicate better comparative fit. For negatively-valenced CHANGE variables, a two-factor model in which negative cognitions, emotions, behaviors, and somatic experiences loaded onto one latent factor and avoidance, rumination, and overgeneralization loaded onto a second factor (AIC = 5815.02, BIC = 5931.70) fit the data better than a model in which all seven indicators loaded onto one latent factor (AIC = 5828.15, BIC = 5940.80). The two-factor model also fit the data better than a three-factor model splitting the negative domains factor based on intercorrelations

among indicator variables such that cognitions and emotions loaded onto one factor, and behaviors and somatic loaded onto another (AIC = 5818.84, BIC = 5943.57). The two-factor model also fit better than a three-factor model splitting the maladaptive ER strategies factor such that avoidance loaded onto a different factor than rumination and overgeneralization (AIC = 5815.42, BIC = 5940.15).

For positively-valenced CHANGE variables, a two-factor model in which positive cognitions, emotions, behaviors, and somatic experiences loaded onto one latent factor and decentering, meaning-making, and accommodation loaded onto a second factor (AIC = 5530.73, BIC = 5647.41) fit the data better than a model in which all seven indicators loaded onto one latent factor (AIC = 5594.24, BIC = 5706.89). The two-factor model also fit the data better than a three-factor model splitting the positive domains into one factor with cognitions and emotions and another factor with behaviors and somatic experiences, based on the indicators' intercorrelations (AIC = 5532.98, BIC = 5657.71). In addition, the two-factor model fit better than a three-factor model splitting the adaptive ER strategies factor to separate decentering from meaning-making and accommodation (AIC = 5531.01, BIC = 5655.73). While we could have used the latent factors created in these analyses as composites instead of calculating averages or sums of scores (Patrick & Hajcak, 2016), latent variables capture the common elements of the indicator variables and eliminate their specificity (considered "measurement error"). In this study, we did not seek to eliminate specificity, but rather to account for the uniqueness of each indicator. We therefore computed composite variables for negative and positive domain network activation and for maladaptive and adaptive ER strategies.

2.3.1.1.2 Negative and positive network activation.

Based on emotional processing theory (Foa et al., 2006), an important aim of treatment is to activate multiple domains of the relevant negative network and then to weaken that network, and also to strengthen a network of new learning that is similarly multimodal. For each individual at each session, separate negative and positive domain network activation variables incorporated cognitive, emotional, behavioral, and somatic experiences. For the cognitive domain, negative and positive cognition scores were calculated by taking the highest of three codes representing negative or positive cognitions about the self, relationships with others, and hope for the future. Then, a negative and positive network activation score was operationalized as a count of the number of respective domains activated (i.e., cognitive, emotional, behavioral, and somatic domains of functioning; range 0-4) at a threshold of a moderate to high level (i.e., ≥ 2 on the 0-3 CHANGE scale). The network activation scores represent the breadth of activation across domains of functioning (0-4 domains at or above threshold) at each session, rather than a total sum of activation.

2.3.1.1.3 Maladaptive and adaptive emotion regulation (ER) strategies.

The overall levels of maladaptive and adaptive ER strategies were of interest rather than how many of the strategies were used. For each individual at each session, a maladaptive emotion regulation (ER) variable was operationalized as the sum of the scores of three types of maladaptive ER: avoidance, rumination, and overgeneralization (range 0-3 each, 0-9 total). An adaptive ER variable was operationalized as the sum of the scores of three types of adaptive ER: decentering, meaning-making, and accommodation (range 0-3 each, 0-9 total).

2.3.2 Treatment outcomes.

At the beginning of treatment and at 6 months post-randomization (i.e., approximately post-treatment), participants' caregivers completed the Child Behavior Checklist (CBCL; Achenbach & Rescorla, 2001). The CBCL asks parents to rate 113 items assessing a range of child emotional and behavioral problems, each rated on a three-point Likert scale from 0 (*not true*) to 2 (*very true or often true*). The current study focused on the Internalizing and Externalizing scales of the CBCL to provide a measure of broadband symptomatology. In youth treatment, broadband measures have been recommended over more symptom-specific measures to capture therapeutic change (Becker, Chorpita, & Daleiden, 2011). The CBCL assesses a broad array of potentially trauma-related symptoms, including those not captured by a PTSD-specific measure. We used raw scores, as T-scores can truncate the range of data and be less sensitive to gradual changes in symptomatology during treatment and follow-up (Achenbach, 1991). The CBCL is a well-established measure of mental health problems in children with good reliability and validity (Achenbach & Rescorla, 2001). In the current sample, reliability across time points was excellent for both the Internalizing scale (Cronbach's $\alpha = .89$ to $.90$) and the Externalizing scale (Cronbach's $\alpha = .92$ to $.95$).

2.4 Data Analytic Approach

Data were analyzed in Mplus 7 (Muthén & Muthén, 1998-2012). Multilevel modeling was used to account for the hierarchical structure of the data (i.e., sessions nested within participants). Within-person slopes of emotional processing components over time were entered as predictors of post-treatment outcomes (internalizing and externalizing). Random slopes were estimated to allow for slopes to vary from person

to person, and random slopes can be treated as predictors of between-person outcomes. Three sets of models were repeated across internalizing and externalizing outcomes for a total of six models. In the first two models, within-person slopes of negative and positive network activation were estimated to represent each individual's linear change in these variables over time. At the within-person level of each model, random slopes of negative networks and positive networks were estimated using each individual's repeated measures by regressing each of these two variables on session number, coded such that the first session was coded as 0. At the between-person level, the treatment outcome (internalizing or externalizing) was regressed on the within-person slopes of negative and positive networks, controlling for the baseline level of the outcome variable. These models included both negative and positive network activation in order to account for the activation of opposite-valenced variables together. These models did not include all four predictor variables (i.e., negative and positive network activation and maladaptive and adaptive ER strategies) in order to avoid problems with collinearity between negative variables (i.e., negative networks and maladaptive ER strategies) and positive variables (i.e., positive networks and adaptive ER strategies). Additionally, these models controlled for the baseline level of each outcome to account for any effects of baseline symptom severity and to better capture changes in symptoms.

In the third and fourth models, the within-person quadratic slope of negative network activation was entered as a predictor of internalizing and externalizing symptoms. In order to reduce collinearity between linear and quadratic time terms, session number was grand-mean centered in these analyses. At the within-person level, random slopes were estimated using each individual's repeated measures by

regressing negative networks on linear (i.e., centered session number) and quadratic (centered session number squared) session terms. At the between-person level of each model, the treatment outcome (internalizing or externalizing) was regressed on the within-person quadratic slope of change in negative network activation, controlling for the baseline level of the outcome.

The fifth and sixth models were identical to the first and second models, except that instead of within-person slopes of network activation, random slopes of maladaptive and adaptive ER strategies were estimated at the within-person level and entered simultaneously as predictors of treatment outcomes at the between-person level.

Chapter 3

RESULTS

3.1 Preliminary Analyses

Descriptive statistics for within-person (session-by-session) variables of interest and their intercorrelations are presented in Table 3.1. Of note, negative variables (negative network activation and maladaptive ER strategies) were moderately positively correlated, as were positive variables (positive network activation and adaptive ER strategies), indicating that network activation and ER strategies are related but also qualitatively different constructs, consistent with results of the preliminary CFAs. Negative and positive network activation were uncorrelated, and maladaptive and adaptive ER strategies were slightly negatively correlated, suggesting that the negative variables are not simply the inverse of the positive variables. Descriptive statistics for between-person outcome variables (internalizing and externalizing) at baseline and post-treatment and their intercorrelations are presented in Table 3.2. Internalizing and externalizing symptom severity were positively correlated at all time points. Table 3.3 includes the fixed effects and random effects of within-person slopes over time for the network and ER variables that were the predictor variables in main analyses. Based on estimates of the averages and variances of these slopes, 95% of the present sample ranged from negative to positive values for all slopes of interest.

Table 3.1: Descriptive statistics for and intercorrelations among within-person composite variables representing components of emotional processing.

	Negative Network	Positive Network	Maladaptive ER Strategies	Adaptive ER Strategies
Negative Network	—			
Positive Network	.10	—		
Maladaptive ER Strategies	.40**	-.13*	—	
Adaptive ER Strategies	.02	.39**	-.10*	—
Mean	1.34	.88	1.98	1.71
SD	1.01	.91	1.84	1.90
Range	0-4	0-3	0-9	0-9

Note. ER = emotion regulation. Negative Network is a composite variable representing the number of nodes (cognitive, emotional, behavioral, somatic) of the pathological network activated. Positive Network is a composite variable representing the number of nodes (cognitive, emotional, behavioral, somatic) of the new learning network activated. Maladaptive ER strategies represents the sum of avoidance, rumination, and overgeneralization variables. Adaptive ER Strategies represents the sum of decentering, meaning-making, and accommodation variables. * $p < .05$, ** $p < .01$

Table 3.2: Descriptive statistics and intercorrelations among between-person outcome measures.

	Internalizing Baseline	Internalizing Post-Treatment	Externalizing Baseline	Externalizing Post-Treatment
Internalizing Baseline	—			
Internalizing Post-Treatment	.57***	—		
Externalizing Baseline	.64***	.36**	—	
Externalizing Post-Treatment	.28*	.61***	.54***	—
Mean	14.86	8.90	16.98	12.03
SD	9.00	7.92	13.17	11.12
Range	0-36	0-34	0-49	0-44

Note. * $p < .05$; ** $p < .01$, *** $p < .001$

Table 3.3: Fixed effects and random effects for within-person slopes of change over time of composite variables representing components of emotional processing.

	Negative Network Slope	Negative Network Quadratic Slope	Positive Network Slope	Maladaptive ER Strategies Slope	Adaptive ER Strategies Slope
Fixed Effect	.02	-.02	.04	.12**	.16*
Random Effect	.01*	.002	.01	.08*	.09*
95% Sample Range for Random Effect	-.19 to .24	-.11 to .06	-.13 to .20	-.42 to .66	-.42 to .74

Note. ER = emotion regulation. Slopes are linear unless quadratic slopes are specified.

* $p < .05$, ** $p < .01$

3.2 Predictors of Treatment Outcome

For each model, unstandardized and standardized beta values, standard errors, z values, and p values for each predictor are presented in Table 3.4. The results of the first two models, which regressed internalizing and externalizing outcomes on within-person slopes of negative and positive network activation, controlling for baseline symptoms, suggested that linear change in multimodal negative network activation over the trauma processing phase of TF-CBT did not predict post-treatment internalizing or externalizing symptoms. More positive linear change in multimodal positive network activation predicted lower externalizing (but not internalizing) symptoms at post-treatment. The third and fourth models, which regressed internalizing and externalizing outcomes on within-person quadratic slopes of negative network activation, indicated that while the linear slope of negative network activation did not predict post-treatment outcomes, the quadratic shape of change did predict internalizing, but not externalizing symptoms. The effect was such that a more negative curve (concave down) predicted lower post-treatment internalizing symptoms. The fifth and sixth models, which regressed internalizing and externalizing outcomes on within-person slopes of maladaptive and adaptive ER strategies, showed that more negative linear change in maladaptive ER strategies over the course of the trauma processing treatment phase predicted lower internalizing (but not externalizing) symptoms at post-treatment. More positive linear change in adaptive ER strategies predicted lower post-treatment externalizing (but not internalizing) symptoms.

Table 3.4: Regression results for within-person slopes of components of emotional processing (negative and positive networks of functioning and maladaptive and adaptive emotion regulation strategies) predicting post-treatment outcomes (internalizing and externalizing symptoms), controlling for baseline symptoms.

Model	Predictor (Within-Person Slope)	Post-Treatment Outcome	B	β	SE	z	p
1	Negative Network	Internalizing	61.84	.15	260.12	.24	.81
	Positive Network		-138.32	-.52	177.89	-.78	.44
2	Negative Network	Externalizing	-33.69	-.05	1336.13	-.03	.98
	Positive Network		-313.53	-.54	40.63	-7.72	<.01**
3	Negative Network: Quadratic	Internalizing	268.41	.21	50.83	5.28	<.01**
4	Negative Network: Quadratic	Externalizing	-714.59	-.72	535.32	-1.34	.18
5	Maladaptive ER Strategies	Internalizing	5.93	.07	2.50	2.37	.02*
	Adaptive ER Strategies		-20.39	-.44	26.81	-.76	.45
6	Maladaptive ER Strategies	Externalizing	.50	.00	124.83	.00	.99
	Adaptive ER Strategies		-34.12	-.34	7.47	-4.57	<.01**

Note. B = unstandardized beta, β = standardized beta, SE = standard error, ER = emotion regulation. Predictors indicate linear slopes over time unless quadratic slopes are specified. * $p < .05$, ** $p < .01$

Chapter 4

DISCUSSION

The current study examined emotional processing as a predictor of symptom outcomes in a community sample of trauma-exposed youth receiving TF-CBT. Emotional processing was assessed broadly, in line with Foa and colleagues' updated theory (2006) and informed by other prominent theories of change (inhibitory learning, emotional experiencing, and cognitive theories). Instead of assessing only fear reduction over the course of TF-CBT, we operationalized emotional processing in four ways: 1) linear decreases and curvilinear patterns of change (concave down) in a multimodal network of old learning that includes cognitive, emotional, behavioral, and somatic domains of functioning; 2) increases in a multimodal network of new, positive learning in the same domains; 3) reductions in maladaptive emotion regulation (ER) strategies (avoidance, rumination, and overgeneralization); and 4) increases in adaptive ER strategies (decentering, meaning-making, and accommodation). We hypothesized that changes in each of these four components of emotional processing, measured at each session over the course of the trauma processing phase of TF-CBT, would predict more improvement in post-treatment internalizing and externalizing symptom outcomes.

Linear change in the multimodal activation of the negative network did not predict treatment outcomes, but as hypothesized, a more negative curvilinear pattern (more concave down) did predict lower post-treatment internalizing symptoms, which likely captured the symptoms of PTSD and related anxiety and depression. This

curvilinear pattern was specific to the internalizing symptoms and did not predict post-treatment externalizing symptoms. Similarly, greater decreases in maladaptive ER strategies predicted lower post-treatment internalizing symptoms, but not externalizing symptoms. In contrast, greater increases in multimodal activation of the positive network predicted lower post-treatment externalizing but not internalizing symptoms. Greater increases in adaptive ER strategies also predicted lower post-treatment externalizing symptoms, but not internalizing.

In line with hypotheses, each of the four components of emotional processing predicted better post-treatment outcomes on either internalizing or externalizing symptoms, although not both. The pattern of findings suggests that changes in maladaptive elements of old learning related to traumatic experiences may operate on different sets of symptoms (internalizing) than the strengthening of new learning, which predicted improvement in externalizing symptoms. Negative cognitions, emotions, behaviors, and somatic experiences and maladaptive ER strategies, such as rumination and avoidance, are generally more characteristic of internalizing than externalizing problems. Increases in positive cognitions and emotions, use of positive behavioral skills like relaxation, and improved ability to engage in adaptive ER strategies, such as decentering and meaning-making, may help youth develop more adaptive responses to stressful situations instead of responding with externalizing behaviors, such as aggression and impulsive behaviors.

These findings are inconsistent, however, with the results of a few prior studies. Ready and colleagues (2015) found that more accommodation during the trauma processing phase in this sample predicted lower internalizing outcomes at post-treatment. In cognitive processing therapy for adults with PTSD, Dondanville and

colleagues (2016) similarly found that more accommodation during treatment predicted greater improvement in PTSD and depression, and Iverson and colleagues (2015) also found that greater improvement in accommodation between post-treatment and 5-10 year follow-up was associated with better PTSD and depression outcomes. Deblinger, Mannarino, Cohen, Runyon, and Steer (2011) compared outcomes in TF-CBT provided with and without the trauma narrative phase of treatment, and they found, at odds with our findings, that post-treatment externalizing was lower in youth who engaged in TF-CBT without the narrative phase. The increases in positive domains of functioning and ER strategies that predicted better externalizing outcomes in the present study were likely facilitated by exposure to and processing of traumatic experiences during the narrative phase of treatment. This finding suggests promise for externalizing youth who engage in this phase of treatment.

This is the first study to test the predictive validity of a model of emotional processing that, in line with the current update of emotional processing theory (Foa et al., 2006), incorporates multimodal networks of old and new learning that include not only fear responses, but also cognitions, non-fear emotions, behaviors, and somatic experiences. We also examined ER strategies hypothesized to interfere with change (avoidance, rumination, and overgeneralization) and those thought to facilitate change (decentering, meaning-making, and accommodation). Although historically emphasized as a mechanism of emotional processing, between-session reductions in fear response have inconsistently predicted symptom outcomes (Asnaani et al., 2016; Craske et al., 2008). We found that curvilinear (concave down) change in a broader, multimodal network of maladaptive cognitions, affect, behavior, and somatic functioning did predict improvement in internalizing symptoms at post-treatment. This

pattern, potentially representing an increase and then decrease in this network, might reflect more than fear extinction and instead capture change across multiple domains of functioning. These findings suggest promise in using a broader measure of the network of old learning than fear alone, as well as the importance of examining more than linear patterns of change. Additionally, the present findings are consistent with theories highlighting the importance of cognitive changes (e.g., Beck & Dozois, 2011; Ehlers & Clark, 2000; Resick & Schnicke, 1992), general emotional changes (e.g., Greenberg, 2012), and increases in positive learning (e.g., Craske et al., 2008). These findings also converge with recent studies demonstrating that several non-fear elements of emotional processing predict treatment outcomes, and with Foa and colleagues' affirmation of the importance of these elements to emotional processing (e.g., Foa & McLean, 2016). These predictors include maladaptive cognitions (e.g., McLean et al., 2015; Scher et al., 2017), negative and positive emotions (e.g., Dour et al., 2016; Kaczurkin et al., 2016; Zbozinek & Craske, 2017), maladaptive ER strategies (e.g., Ehlers, et al., 1998, Ready et al., 2015) and adaptive ER strategies (e.g., Dondanville et al., 2016; Hayes et al., 2017; Ready et al., 2015).

It is important to note that each of these prior studies examines only one component of emotional processing at a time rather than a network of functioning across cognitive, emotional, behavioral, and somatic domains, together with maladaptive and adaptive ER strategies. We integrated multiple lines of research to examine different components of emotional processing concurrently, and our findings suggest the utility of such an integrated conceptualization and measurement of emotional processing. Further, this approach brings measurement more in line with the multifaceted maladaptive and adaptive networks of stimuli, responses, and meaning

posited in modern emotional processing theory and with the current theory's emphasis on changes in associations in these networks as the proposed mechanism of symptom reduction (Foa et al., 2006). Despite evidence that fear reduction may not be necessary for change in exposure therapies (Bluett, Zoellner, & Feeny, 2014; Craske et al., 2008), emotional processing theory, conceptualized broadly as networks of stimuli, multimodal responses, and meaning, might yield useful predictors of treatment outcomes, with implications for treatment refinement and development. Broadening this line of research, while continuing to pursue other lines of research such as inhibitory learning (Craske et al., 2008; 2014), will ultimately help us understand how to maximize psychotherapy outcomes in exposure therapies for anxiety, stressor-related, and internalizing disorders.

4.1 Strengths, Limitations, and Future Directions

One strength of the present study is the repeated, session-by-session measurement of various domains of functioning and ER strategies over the phase of TF-CBT that targets trauma exposure and processing. The longitudinal study design allowed for the estimation of within-person slopes of change over time and their use as predictors of outcomes. Symptoms were not measured session-by-session, however, so we cannot rule out the possibility that symptom change preceded change in the components of emotional processing that were examined as predictors (Kazdin, 2007). Future studies should include session-by-session measurements of both hypothesized components of emotional processing and symptom outcomes in order to better establish temporal precedence of changes.

Another strength of the present study is that the CHANGE coding system (Hayes et al., 2007) allowed for the measurement of multiple domains of functioning

and ER strategies in one study, as they occurred in session. The measurement of all of these variables allowed for the creation of composites representing networks of old and new learning as well as use of maladaptive and adaptive strategies to regulate emotions. We were also able to confirm that for both negative and positive constructs, observed measures of domains of functioning and ER strategies loaded best onto two latent factors as compared with one- and three-factor models. Findings also suggested that, while some of these components of emotional processing are related, negative networks and ER strategies represent more than the inverse of positive networks and ER strategies. These findings may have measurement implications for future studies of processes of change during therapy.

Further, all domains of functioning and ER strategies were measured in the same way (i.e., observation of verbal report and some audible nonverbal cues, such as crying). This reduces measurement method as a confound in relationships among constructs. On the other hand, observational coding is only one method, and it relies on client verbalizations. Future studies could include different types measures of each construct, including self-reports, psychophysiological measures, and lab tasks. These multiple measures could be used to construct networks of maladaptive and adaptive responses to stimuli and meaning (Cronbach & Meehl, 1955) that could be examined as potential mechanisms of change in exposure therapies.

Additionally, we calculated composite measures of domains of functioning and ER strategies rather than using statistical methods capable of modeling constellations of variables and their connectivity, such as network modeling (e.g., Borsboom & Cramer, 2013; Boschloo et al., 2015). Network analyses were not appropriate for the current data due to the session-by-session assessment schedule. Network analyses

incorporate not only the level of activation of each node of the network (e.g., negative emotions rated from 0-3), but also the correlations (i.e., edges) among the nodes (Borsboom & Cramer, 2013). To calculate changes in associations within the network for individuals over time, each individual must have multiple assessments within each time period of interest (e.g., seven daily measurements between weekly sessions, in order to examine change in associations from week to week during therapy). Variables of interest were coded only once per session, so we could not examine changes in associations within individuals' networks of domains and ER strategies across sessions of the trauma narrative phase of TF-CBT. Future research could collect data dense enough to apply network analyses to examine emotional processing during treatment.

The sample that we selected to study emotional processing theory has both strengths and limitations. Emotional processing was examined in trauma-exposed children and adolescents who received TF-CBT in community mental health centers. The findings contribute literature showing that therapies informed by emotional processing theory are effective when delivered in community settings (e.g., Foa et al., 2005; Webb, Hayes, Grasso, Laurenceau, & Deblinger, 2014) and that emotional processing theory is relevant in treatments for youth (e.g., Cohen et al., 2006; Foa, McLean, Capaldi, & Rosenfield, 2013; Franklin et al., 2011). Although symptoms of PTSD and CBCL internalizing and externalizing symptoms all decreased significantly over the course of TF-CBT in this trial (Webb et al., 2014), the process studies from this trial have identified important predictors of the CBCL scales (Hayes et al., 2017; Ready et al., 2015; Yasinski et al., 2016), but no significant predictors of PTSD symptoms on the UCLA PTSD Reaction Index for DSM-IV-Abbreviated (UPID-A;

Steinberg et al., 2004). This may be in part because youth did not need to meet criteria for PTSD to be included in the present sample, or because the measure of PTSD symptoms relied on youth self-report rather than caregiver report or a combination of youth and caregiver report (Ready et al., 2015). Our results, though less specific than findings predicting PTSD symptoms, are in line with Becker et al.'s (2011) recommendation to use broadband measures to capture change in youth psychotherapy, and they do identify important in-session predictors of change in internalizing and externalizing over the course of TF-CBT.

It should also be noted that the present sample only included youth who completed at least one session in the trauma processing (second) phase of treatment. While there were no differences on demographic measures between these youth and youth who discontinued therapy before that point, there could be other differences between these groups. In addition, we focused on the trauma processing phase of TF-CBT because sessions in this phase facilitate exposure to traumatic memories and emotional processing of trauma-related content. The treatment also includes a stabilization and skills building phase and a consolidation and closure phase, which focus on skills building, in vivo mastery, and conjoint sessions with the caregiver when appropriate. Data collected during these phases of treatment were not examined. Overall, future studies should aim to replicate these findings in other samples of youth and adults receiving various exposure therapies for anxiety, trauma-related, and internalizing disorders to determine whether the present findings generalize beyond the current sample.

Although we investigated multimodal networks of negative and positive functioning and maladaptive and adaptive ER strategies, we did not examine which of

the individual elements of these composites best predicted symptom outcomes. Some variables included in these composites have already been examined as predictors of treatment outcomes in this sample: less overgeneralization and more accommodation during the trauma narrative phase predicted greater improvement in internalizing (Ready et al., 2015), and more decentering during the same phase predicted more improvement in externalizing (Hayes et al., 2017). We also did not investigate whether client and/or treatment characteristics might interact with changes in cognitions, emotions, behaviors, somatic experiences, and ER strategies to predict symptom change. For example, it is possible that changes in cognitions may matter more for adolescents and adults than for younger children. If these broad emotional processing components continue to be useful, in larger samples, moderation effects could be examined to better understand under what circumstances different components of emotional processing are more predictive of improvement during treatment.

4.2 Conclusion

The present study is the first to operationalize emotional processing broadly, in line with the updated version of emotional processing theory (Foa et al., 2006) and informed by other theories of change, to incorporate changes in multimodal networks of old and new learning, as well as maladaptive and adaptive emotion regulation strategies. Results highlight the importance of each of these components of emotional processing as predictors of treatment outcomes. The mixed findings on traditional measures of emotional processing (i.e., between-session reductions in fear response) have prompted some researchers to declare that emotional processing theory is of limited utility (e.g., Baker et al., 2010; Craske et al., 2008), yet our findings suggest that perhaps a broader measurement approach that is more in line with the current

version of emotional processing theory (Foa et al., 2006) might be fruitful. Our findings suggest that clinicians should attend to multiple elements of change during treatment to best foster positive outcomes, including activating and reducing multiple domains of negative functioning and decreasing maladaptive ER strategies, while also increasing new, more positive learning and facilitating more adaptive ER strategies. Future research is needed to replicate and expand the current findings, but this study is one step in an ongoing effort to refine and measure theories of change in exposure-based therapies. These findings might also suggest ways that emotional processing, inhibitory learning, and other theories of change can come together rather than remaining rival perspectives, and perhaps help the field move toward more integrated models of change in psychotherapy.

REFERENCES

- Abel, A., Hayes, A. M., Henley, W., & Kuyken, W. (2016). Sudden gains in cognitive-behavior therapy for treatment-resistant depression: Processes of change. *Journal of Consulting and Clinical Psychology, 84*(8), 726-737.
- Achenbach, T. M. (1991). *Manual for the Child Behavior Checklist 4-18 and 1991 profile*. Burlington: Department of Psychiatry, University of Vermont.
- Achenbach, T. M., & Rescorla, L. A. (2001). *Manual for the ASEBA school-age forms & profiles*. Burlington, VT: University of Vermont, Research Center for Children, Youth, & Families.
- Arch, J. J., & Craske, M. G. (2008). Acceptance and commitment therapy and cognitive behavioral therapy for anxiety disorders: Different treatments, similar mechanisms? *Clinical Psychology: Science and Practice, 15*(4), 263-279.
- Asnaani, A., McLean, C. P., & Foa, E. B. (2016). Updating Watson & Marks (1971): How has our understanding of the mechanisms of extinction learning evolved and where is our field going next? *Behavior Therapy, 47*(5), 654-668.
- Baker, A., Mystkowski, J., Culver, N., Yi, R., Mortazavi, A., & Craske, M. G. (2010). Does habituation matter? Emotional processing theory and exposure therapy for acrophobia. *Behaviour Research and Therapy, 48*(11), 1139-1143.
- Barnes, J. B. (2017). *Therapeutic processes in written exposure therapy and cognitive processing therapy* (Unpublished doctoral dissertation). University of Delaware, Newark, DE.
- Beck, A. T., & Dozois, D. J. (2011). Cognitive therapy: Current status and future directions. *Annual Review of Medicine, 62*, 397-409.
- Becker, K. D., Chorpita, B. F., & Daleiden, E. L. (2011). Improvement in symptoms versus functioning: How do our best treatments measure up? *Administration and Policy in Mental Health and Mental Health Services Research, 38*(6), 440-458.

- Bluett, E. J., Zoellner, L. A., & Feeny, N. C. (2014). Does change in distress matter? Mechanisms of change in prolonged exposure for PTSD. *Journal of Behavior Therapy and Experimental Psychiatry*, 45(1), 97-104.
- Borsboom, D., & Cramer, A. O. J. (2013). Network analysis: An integrative approach to the structure of psychopathology. *Annual Review of Clinical Psychology*, 9, 91-121.
- Boschloo, L., van Borkulo, C. D., Rhemtulla, M., Keyes, K. M., Borsboom, D., & Schoevers, R. A. (2015). The network structure of symptoms of the diagnostic and statistical manual of mental disorders. *PLoS ONE*, 10(9).
- Bouton, M. E. (2000). A Learning theory perspective on lapse, relapse, and the maintenance of behavior change. *Health Psychology*, 19 (1 Suppl), 57-63.
- Cohen, J. A., Mannarino, A. P., & Deblinger, E. (2006). *Treating trauma and traumatic grief in children and adolescents*. New York, NY: Guilford Press.
- Craske, M. G., Kircanski, K., Zelikowsky, M., Mystkowski, J., Chowdhury, N., & Baker, A. (2008). Optimizing inhibitory learning during exposure therapy. *Behaviour Research and Therapy*, 46(1), 5-27.
- Craske, M. G., Treanor, M., Conway, C. C., Zbozinek, T., & Vervliet, B. (2014). Maximizing exposure therapy: An inhibitory learning approach. *Behaviour Research and Therapy*, 58, 10-23.
- Cronbach, L. J., & Meehl, P. E. (1955). Construct validity in psychological tests. *Psychological Bulletin*, 52(4), 281-302.
- Deblinger, E., Mannarino, A. P., Cohen, J. A., Runyon, M. K., & Steer, R. A. (2011). Trauma-focused cognitive behavioral therapy for children: Impact of the trauma narrative and treatment length. *Depression and Anxiety*, 28(1), 67-75.
- Disner, S. G., Beevers, C. G., Haigh, E. A. P., & Beck, A. T. (2011). Neural mechanisms of the cognitive model of depression. *Nature Reviews Neuroscience*, 12(8), 467-477.
- Dondanville, K. A., Blankenship, A. E., Molino, A., Resick, P. A., Wachen, J. S., Mintz, J., . . . Peterson, A. L. (2016). Qualitative examination of cognitive change during PTSD treatment for active duty service members. *Behaviour Research and Therapy*, 79, 1-6.

- Dour, H. J., Brown, L. A., & Craske, M. G. (2016). Positive valence reduces susceptibility to return of fear and enhances approach behavior. *Journal of Behavior Therapy and Experimental Psychiatry*, 50, 277-282.
- Ehlers, A., & Clark, D. M. (2000). A cognitive model of posttraumatic stress disorder. *Behaviour Research and Therapy*, 38(4), 319-345.
- Ehlers, A., Mayou, R. A., & Bryant, B. (1998). Psychological predictors of chronic posttraumatic stress disorder after motor vehicle accidents. *Journal of Abnormal Psychology*, 107(3), 508-519.
- Foa, E. B., Hembree, E. A., Cahill, S. P., Rauch, S. A. M., Riggs, D. S., Feeny, N. C., & Yadin, E. (2005). Randomized trial of prolonged exposure for posttraumatic stress disorder with and without cognitive restructuring: Outcome at academic and community clinics. *Journal of Consulting and Clinical Psychology*, 73(5), 953-964.
- Foa, E. B., Hembree, E. A., & Rothbaum, B. O. (2007). *Prolonged exposure therapy for PTSD: Emotional processing of traumatic experiences: Therapist guide*. New York, NY: Oxford University Press.
- Foa, E. B., Huppert, J. D., & Cahill, S. P. (2006). Emotional processing theory: An update. In B. O. Rothbaum (Ed.), *Pathological anxiety: Emotional processing in etiology and treatment* (pp. 3-24). New York, NY: Guilford Press.
- Foa, E. B., & Kozak, M. J. (1986). Emotional processing of fear: Exposure to corrective information. *Psychological Bulletin*, 99(1), 20-35.
- Foa, E. B., & McLean, C. P. (2016). The efficacy of exposure therapy for anxiety-related disorders and its underlying mechanisms: The case of OCD and PTSD. *Annual Review of Clinical Psychology*, 12, 1-28.
- Foa, E. B., McLean, C. P., Capaldi, S., & Rosenfield, D. (2013). Prolonged exposure vs. supportive counseling for sexual abuse-related PTSD in adolescent girls: A randomized clinical trial. *JAMA: Journal of the American Medical Association*, 310(24), 2650-2657.
- Foa, E. B., & McNally R. J. (1996). Mechanisms of change in exposure therapy. In R. M. Rapee (ed.), *Current controversies in the anxiety disorders* (pp. 214-227). New York, NY: Guilford Press.

- Franklin, M. E., Sapyta, J., Freeman, J. B., Khanna, M., Compton, S., Almirall, D., . . . March, J. S. (2011). Cognitive behavior therapy augmentation of pharmacotherapy in pediatric obsessive-compulsive disorder: The pediatric OCD treatment study II (POTS II) randomized controlled trial. *JAMA: Journal of the American Medical Association*, 306(11), 1224-1232.
- Greenberg, L. S. (2002). *Emotion-focused therapy: Coaching clients to work through feelings*. Washington, DC: American Psychological Association.
- Greenberg, L. S. (2012). Emotions, the great captains of our lives: Their role in the process of change in psychotherapy. *American Psychologist*, 67(8), 697-707.
- Greenberg, L. S., & Foerster, F. S. (1996). Task analysis exemplified: The process of resolving unfinished business. *Journal of Consulting and Clinical Psychology*, 64(3), 439-446.
- Greenberg, L. S., & Safran, J. D. (1987). *Emotion in psychotherapy: Affect, cognition, and the process of change*. New York, NY: Guilford Press.
- Gross, J. J. (2008). Emotion regulation. In M. Lewis, J. M. Haviland-Jones, & L. F. Barrett (Eds.), *Handbook of emotions* (3rd ed. pp. 497-512). New York, NY: Guilford Press.
- Hallgren, K. A. (2012). Computing inter-rater reliability for observational data: An overview and tutorial. *Tutorials for Quantitative Methods in Psychology*, 8(1), 23-34.
- Hayes, A. M., Beevers, C. G., Feldman, G. C., Laurenceau, J., & Perlman, C. (2005). Avoidance and processing as predictors of symptom change and positive growth in an integrative therapy for depression. *International Journal of Behavioral Medicine*, 12(2), 111-122.
- Hayes, A. M., Feldman, G. C., & Goldfried, M. R. (2007). The change and growth experiences scale: A measure of insight and emotional processing. *Insight in psychotherapy*. (pp. 231-253). American Psychological Association, Washington, DC.
- Hayes, A. M., & Yasinski, C. (2015). Pattern destabilization and emotional processing in cognitive therapy for personality disorders. *Frontiers in psychology*, 6.
- Hayes, A. M., Yasinski, C., Grasso, D., Ready, C. B., Alpert, E., McCauley, T., . . . Deblinger, E. (2017). Constructive and unproductive processing of traumatic experiences in trauma-focused cognitive-behavioral therapy for youth. *Behavior Therapy*, 48(2), 166-181.

- Iverson, K. M., King, M. W., Cunningham, K. C., & Resick, P. A. (2015). Rape survivors' trauma-related beliefs before and after cognitive processing therapy: Associations with PTSD and depression symptoms. *Behaviour Research and Therapy*, 66, 49-55.
- Jacoby, R. J., & Abramowitz, J. S. (2016). Inhibitory learning approaches to exposure therapy: A critical review and translation to obsessive-compulsive disorder. *Clinical Psychology Review*, 49, 28-40.
- Kaczurkin, A. N., Asnaani, A., Zhong, J., & Foa, E. B. (2016). The moderating effect of state anger on treatment outcome in female adolescents with PTSD. *Journal of Traumatic Stress*, 29(4), 325-331.
- Kazdin, A. E. (2007). Mediators and mechanisms of change in psychotherapy research. *Annual Review of Clinical Psychology*, 3, 1-27.
- Kleim, B., Grey, N., Wild, J., Nussbeck, F. W., Stott, R., Hackmann, A., . . . Ehlers, A. (2013). Cognitive change predicts symptom reduction with cognitive therapy for posttraumatic stress disorder. *Journal of Consulting and Clinical Psychology*, 81(3), 383-393.
- Lang, P. J. (1977). Imagery in therapy: An information processing analysis of fear. *Behavior Therapy*, 8(5), 862-886.
- McLean, C. P., & Foa, E. B. (2017). Emotions and emotion regulation in posttraumatic stress disorder. *Current Opinion in Psychology*, 14, 72-77.
- McLean, C. P., Su, Y., & Foa, E. B. (2015). Mechanisms of symptom reduction in a combined treatment for comorbid posttraumatic stress disorder and alcohol dependence. *Journal of Consulting and Clinical Psychology*, 83(3), 655-661.
- McLean, C. P., Yeh, R., Rosenfield, D., & Foa, E. B. (2015). Changes in negative cognitions mediate PTSD symptom reductions during client-centered therapy and prolonged exposure for adolescents. *Behaviour Research and Therapy*, 68, 64-69.
- Muthén, L. K. and Muthén, B. O. (1998-2012). *Mplus user's guide* (7th ed.). Los Angeles, CA: Muthén & Muthén.
- Paivio, S. C., & Greenberg, L. S. (1995). Resolving "unfinished business": Efficacy of experiential therapy using empty-chair dialogue. *Journal of Consulting and Clinical Psychology*, 63(3), 419-425.

- Paivio, S. C., Hall, I. E., Holowaty, K. A. M., Jellis, J. B., & Tran, N. (2001). Imaginal confrontation for resolving child abuse issues. *Psychotherapy Research, 11*(4), 433-453.
- Paivio, S. C., & Nieuwenhuis, J. A. (2001). Efficacy of emotion focused therapy for adult survivors of child abuse: A preliminary study. *Journal of Traumatic Stress, 14*(1), 115-133.
- Patrick, C. J., & Hajcak, G. (2016). RDoC: Translating promise into progress. *Psychophysiology, 53*(3), 415-424.
- Perrin, S., Leigh, E., Smith, P., Yule, W., Ehlers, A., & Clark, D. M. (2017). Cognitive therapy for PTSD in children and adolescents. In M. A. Landolt, M. Cloitre, & U. Schnyder (Eds.), *Evidence-based treatments for trauma related disorders in children and adolescents* (pp. 187-207). Cham: Springer International Publishing.
- Pfeiffer, E., Sachser, C., de Haan, A., Tutus, D., & Goldbeck, L. (2017). Dysfunctional posttraumatic cognitions as a mediator of symptom reduction in trauma-focused cognitive behavioral therapy with children and adolescents: Results of a randomized controlled trial. *Behaviour Research and Therapy, 97*, 178-182.
- Pos, A. E., Greenberg, L. S., Goldman, R. N., & Korman, L. M. (2003). Emotional processing during experiential treatment of depression. *Journal of Consulting and Clinical Psychology, 71*(6), 1007-1016.
- Ready, C. B., Hayes, A. M., Yasinski, C. W., Webb, C., Gallop, R., Deblinger, E., & Laurenceau, J. (2015). Overgeneralized beliefs, accommodation, and treatment outcome in youth receiving trauma-focused cognitive behavioral therapy for childhood trauma. *Behavior Therapy, 46*(5), 671-688.
- Resick, P. A., Monson, C. M., & Chard, K. M. (2017). *Cognitive processing therapy for PTSD: A comprehensive manual*. New York, NY: Guilford Press.
- Resick, P. A., & Schnicke, M. K. (1992). Cognitive processing therapy for sexual assault victims. *Journal of Consulting and Clinical Psychology, 60*(5), 748-756.
- Scher, C. D., Suvak, M. K., & Resick, P. A. (2017). Trauma cognitions are related to symptoms up to 10 years after cognitive behavioral treatment for posttraumatic stress disorder. *Psychological Trauma: Theory, Research, Practice, and Policy*. Advance online publication.

- Smith, P., Yule, W., Perrin, S., Tranah, T., Dalgleish, T., & Clark, D. M. (2007). Cognitive-behavioral therapy for PTSD in children and adolescents: A preliminary randomized controlled trial. *Journal of the American Academy of Child & Adolescent Psychiatry*, 46(8), 1051-1061.
- Steinberg, A. M., Brymer, M. J., Decker, K. B., & Pynoos, R. S. (2004). The University of California at Los Angeles post-traumatic stress disorder reaction index. *Current Psychiatry Reports*, 6, 96–100.
- Watkins, E. R. (2008). Constructive and unconstructive repetitive thought. *Psychological Bulletin*, 134(2), 163-206.
- Webb, C., Hayes, A. M., Grasso, D., Laurenceau, J., & Deblinger, E. (2014). Trauma-focused cognitive behavioral therapy for youth: Effectiveness in a community setting. *Psychological Trauma: Theory, Research, Practice, and Policy*, 6(5), 555-562.
- Weisz, J.R., & Kazdin, A.E. (2010). The present and future of evidence-based psychotherapies for children and adolescents. In J.R. Weisz & A.E. Kazdin (Eds.), *Evidence-based psychotherapies for children and adolescents* (pp. 557-576). New York, NY, US: The Guilford Press.
- Yancey, J. R., Venables, N. C., & Patrick, C. J. (2016). Psychoneurometric operationalization of threat sensitivity: Relations with clinical symptom and physiological response criteria. *Psychophysiology*, 53(3), 393-405.
- Yasinski, C., Hayes, A. M., Ready, C. B., Cummings, J. A., Berman, I. S., McCauley, T., . . . Deblinger, E. (2016). In-session caregiver behavior predicts symptom change in youth receiving trauma-focused cognitive behavioral therapy (TF-CBT). *Journal of Consulting and Clinical Psychology*, 84(12), 1066-1077.
- Zalta, A. K., Gillihan, S. J., Fisher, A. J., Mintz, J., McLean, C. P., Yehuda, R., & Foa, E. B. (2014). Change in negative cognitions associated with PTSD predicts symptom reduction in prolonged exposure. *Journal of Consulting and Clinical Psychology*, 82(1), 171-175.
- Zbozinek, T. D., & Craske, M. G. (2017). The role of positive affect in enhancing extinction learning and exposure therapy for anxiety disorders. *Journal of Experimental Psychopathology*, 8(1), 1-52.

Appendix A

INSTITUTIONAL REVIEW BOARD EXEMPTION

From: Robin Bhaerman [mailto:no-reply@irbnet.org]
Sent: Tue 4/6/2010 11:55 AM
To: Adele Hayes
Subject: IRBNet Board Action

Please note that University of Delaware IRB has taken the following action on IRBNet:

Project Title: [159593-1] **Trauma-Focused CBT: Potential Mechanisms that Inhibit and Facilitate Change**

Principal Investigator: Adele Hayes, Ph. D.

Submission Type: New Project
Date Submitted: April 2, 2010

Action: EXEMPT
Effective Date: April 6, 2010
Review Type: Exempt Review

Should you have any questions you may contact Robin Bhaerman at bhaerman@udel.edu.

Thank you,
The IRBNet Support Team

www.irbnet.org